





## Stellar Cannibalism

Astronomers have obtained evidence that stars can literally swallow other stars, leading to the ejection of stellar material into space and the formation of extremely close pairs of stars, according to the National Science Foundation (NSF). The discovery supports theoretical predictions of the evolution of double stars.

While studying the central stars of planetary nebulae—disk-shaped gas clouds that vaguely resemble planets—Albert D. Grauer of the University of Arkansas at Little Rock and Howard E. Bond of Louisiana State University at Baton Rouge found that several of these central stars are actually very close stellar pairs. Previously, it had been thought that the central star in a planetary nebula was a single star that expelled a gas cloud as it neared the end of its life. Their latest discovery, the central star of planetary nebula Abell 41, consists of a pair of stars that orbit each other in 2 hours and 43 minutes. The researchers also have found three other central star pairs that have orbital periods of between 11 and 16 hours.

The discoveries support theoretical predictions of the evolution of double stars, the astronomers said. It is believed that when a star exhausts the hydrogen fuel in its interior, it expands to become a huge, cool, red giant. If a star that becomes a red giant happens to have a second star orbiting it—as at least half of all stars do—the companion star may suddenly find itself inside the outer layers of the red giant. Much as an earth satellite's orbit begins to decay once it enters the outer layers of the earth's atmosphere, the swallowed star would then begin a gradual, inward spiral inside the extended atmosphere of the red giant. As the captured star spirals in, it gradually speeds up the rotation of the outer layers of the red giant. This process continues until enough energy is transferred to the outer layers of the red giant to cause them to be expelled, leaving a close pair of orbiting stars surrounded by a nebula gas cloud.

The astronomers used telescopes at Kitt Peak National Observatory near Tucson, Ariz., at Cerro Tololo Inter-American Observatory in Chile, and at the Louisiana State University Observatory. Kitt Peak and Cerro Tololo are national astronomy centers funded by NSF.

## Great Lakes Lab

The Great Lakes Environmental Research Laboratory (GLERL) would close under President Reagan's fiscal year 1984 budget proposal issued on January 31, 1983. GLERL, established in 1974, conducts experimental research in the field and laboratory on the physics, chemistry, and biology of the Great Lakes, their watersheds, sediments, and overlying atmosphere. Closing the lab would represent a cut of more than \$3.6 million from the ocean research program, which is part of the National Oceanic and Atmospheric Administration's (NOAA) ocean and coastal programs activity. Also, it would mean dismissing a staff of 90, according to Eugene Aubert, director of GLERL.

Congressional action on the proposed budget cuts for all of NOAA, including the status of the laboratory, is proceeding through hearings and budget markups. The House has completed its hearings and, as *Eos* went to press, had scheduled a budget markup session for May 11. A Senate Appropriations subcommittee held its hearing on April 26; a budget markup has been tentatively scheduled for late May. GLERL had been proposed to be closed in the fiscal 1983 NOAA budget (*Eos*, February 23, 1982, p. 169), but was reinstated by Congress.

Support for continued operation of the laboratory was expressed in a letter sent by the entire Michigan congressional delegation on March 21, 1983, to the House appropriations subcommittee conducting hearings on the budget proposal to close GLERL.

Of the 15 NOAA Environmental Research Laboratories (ERL), GLERL is one of three "wet" laboratories. Present investigations include a study of the lake-scale structure of waves and their propagation characteristics through the use of 15 current meter moorings deployed in Lake Michigan. Also, the basin runoff behavior of the large watershed of Lake Ontario is under study using an interdependent tank-cascade model; this will develop better forecasting abilities once meteorological information has been supplied. In addition, a program is continuing which investigates the cycling, transport, and fate of toxic organic compounds. Involved in the research are 48 scientists, 30 graduate students, and 12 part-time employees who constitute a staff support.

If GLERL is closed, the fate of this research in progress is unclear. During the April 26 Senate Appropriations subcommittee hearing (*Eos*, May 10, 1983, p. 372), Sen.

## The IMS Source Book

Guide to the International Magnetospheric Study Data Analysis  
G.T. Russell and D.J. Southwood, editors

The International Magnetospheric Study, or IMS, was a coordinated effort to advance the knowledge of the dynamics of the magnetosphere, in particular to study the response of the near-earth environment to varying conditions in interplanetary space.

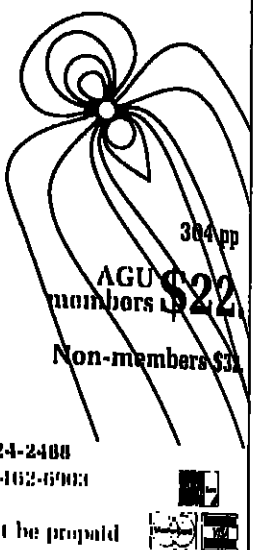
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Lowell P. Weicker, Jr. (R-Conn.), questioned NOAA Administrator John V. Byrne about the impact closing the laboratory would have on environmental research in the Great Lakes. "We anticipate a certain amount of research to continue" at regional universities and through other federal agencies, Byrne told Weicker. Although changes will result from closing the laboratory, "much of the research will continue," Byrne added.

Before the hearing, another NOAA staffer indicated that some projects would simply be terminated if the laboratory were to close, while others may be transferred to the Pacific Marine Environmental Laboratory in Seattle or to the Atlantic Oceanic and Meteorological Laboratory in Miami, the other two wet laboratories in the NOAA system. GLERL Director Aubert argued that the transfer of research projects is highly unlikely. He stressed that the other laboratories are geared mostly toward heavy metal research; GLERL investigates the biology of lake systems and operates a lake hydrology research group that is unique among the ERL. Furthermore, NOAA would not be able to absorb or relocate the personnel involved, Aubert said. A source at NOAA stated that individuals would have to choose to resign, to apply for positions in other parts of NOAA, or to retire, depending on their age and years with the government. The bulk of the research could be conducted by the states in the region, but this could cause a great financial and administrative burden on the states, according to the NOAA staffer.

Among the agencies that use the laboratory's data are the National Weather Service, the Office of Marine Pollution Assessment, the National Ocean Service of the Ocean Assessment Division, the Environmental Protection Agency, and the Army Corps of Engineers. In addition, many states, private institutions, and the general public have access to the data.

Completed data and other project information supplied by GLERL are archived in the National Geophysical Data Center or the National Oceanographic Data Center (*Eos*, April 6, 1982, p. 218). GLERL maintains a working data base that includes information that it originates or gathers from other agencies. This working data base, which is used only by GLERL scientists, would be lost if the laboratory closes.—MREG

## Shell Funds Chair

The Shell Companies Foundation, Inc. of Houston, Tex., has given \$750,000 to the University of Texas at Austin to establish the Shell Distinguished Chair in Geophysics. The 5-year, \$150,000-per-year grant will support the studies of John G. Slater, Schlatter, currently a professor at the Massachusetts Institute of Technology, has accepted a joint position that begins July 1 in the geological sciences department and in the Institute for Geophysics at UT Austin.

Slatter's research in the formation of ocean basins has applications for understanding the way petroleum deposits mature. He has studied the reconstruction of movements of the continents and the subsidence of ocean basins. He is considered an expert in the interpretation of geothermal and seismic data.

The grant is part of the Shell Distinguished Chairs program, established in 1980. The chairs are not endowed, but are 5-year chairs in the sciences, engineering, business, and public affairs. Chair holders are to be promising young scientists with an established reputation as outstanding performers and with potential for continuing brilliant careers, said Doris O'Connor, senior vice president of the Shell Companies Foundation. Previously, Princeton University also received a grant from Shell to support a chair in the geosciences.



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## Books

## Física de la Tierra

Agustín Udías Vallina, Alhambra, Madrid, Spain (in Spanish), x + 73 pp., 1982.

Reviewed by Cinna Lamnitz

This brief introductory textbook fills a definite niche. There have been no accessible references in Spanish on general geophysics. The level of the book requires only a knowledge of high school physics, according to the preface; however, this is not so much a high school text as a reference guide for the general reader.

The book contains four chapters: (1) Gravity and the Shape of the Earth, (2) Earthquakes and the Interior of the Earth, (3) The Magnetic field, and (4) Origins and Evolution of the Earth. The latter chapter contains most of the relevant information on plate tectonics and dynamics of the lithosphere. The sequence of chapters is somewhat awkward, since the idea of lithospheric plates is already introduced in Chapter 2. In fact, the discussion of plate tectonics contains several inconsistencies: In Figure 4-4, for example, volcanoes are shown as plumes rising from the Benioff zone and erupting offshore, on the continental slope. The text compounds the confusion: "Because of the dip angle of the sinking plate, these volcanoes are found behind the coast line. Continental rocks in the collision zone are pushed up to form large mountain ranges in some places, such as the Andes."

The first three chapters are treated in a more traditional fashion and are generally more reliable. Again, they are marred by a few confusing or inaccurate figures and statements.

## EOS

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Cover. Infrared image of plume over Bennett Island taken by weather satellite NOAA-6, at 06:16 UT on February 18, 1983. The plume is fully developed and originates over the NE corner of Bennett Island, one of the DeLong Islands on the Siberian continental shelf. The DeLong Islands are sketched in by hand. Dark areas in this infrared picture mean warmer temperatures (for instance, the open water leads in the ice). Length of plume: 250 km; temperature at the top of the plume: -40°C. For the meteorological conditions of that day, this temperature existed at 7 and 13 km altitude. The most probable altitude of the plume is 7 km. See news item, this issue. (Photo courtesy of J. Kienle, J. G. Roederer, and G. E. Shaw, Geophysical Institute, University of Alaska, Fairbanks.)

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## Other Titles

Deep Drilling Results in the Atlantic Ocean: Continental Margins and Paleoenvironment (1979), edited by M. Talwani, W. Hay, and W.B. Ryan, 439 p.p., ISBN: 0-87590-402-5 List price \$23.00.

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Island Arcs, Deep Sea Trenches, and Back-Arc Basins (1979), edited by M. Talwani and W.C. Pitman, 480 p.p., ISBN: 0-87590-400-9 List price \$23.00.

These minor slips may be attributed to the author's effort to present a large and complex subject on an elementary level and in a compressed yet easily comprehensible format. This necessarily leaves loose ends in the text and makes some statements sound more definitive than they should. I suppose that one ought to judge the results in terms of whether the intention of the author, as stated in the preface, has been achieved: "In this text I aim to present in an accessible form the more elementary foundations of the science called geophysics, or physics of the earth. Professor Udías amply fulfills these expectations. He has provided a lively account—spiced with numerous historical references—of an evolving science. Whenever possible, examples are drawn from Spanish earthquakes; values of the gravity and magnetic fields are given for Spain; and so on. The text contains 10 numbered equations, which seem either too few or too many."

I would predict that many young people in Spain and Latin America will be introduced to geophysics via this attractive, low-priced book.

Cinna Lamnitz is with the Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas, Universidad Nacional Autónoma de México, 01000 México, D. F., México.

## New Publications

Items listed in New Publications can be ordered directly from the publisher; they are not available through AGU.

*Aggregated Information for Development: Reviewing the Green Revolution*, D. F. Cusack (Ed.), Westview Press, Boulder, Colo. xvi + 397 pp., \$20.

*Atlas of Tectonic Maps of Australian Earthquakes*, L. B. Everingham, A. J. McEwin, and D. Denham, *Bulletin 214*, Bureau of Mineral Resources, Geology, and Geophysics, Australian Government Publishing Service, Canberra, unpaginated, 1982.

*Biological Methods of Prospecting for Minerals*, R. B. Brooks, John Wiley, New York, xiv + 322 pp., 1983, \$42.95.

*Development in Geophysical Exploration Methods*, vol. 4, A. A. Fitch (Ed.), Applied Science, New York, x + 200 pp., 1983, \$37.

*The Earth Through Time*, 2nd ed., H. L. Levin, Saunders College Publishing, New York, xvii + 513 pp. + appendix, 1983.

*Fundamental Research on Estuaries: The Importance of an Interdisciplinary Approach*, Panel on Estuarine Research Perspectives, National Research Council, National Academy Press, Washington, D. C., xi + 79 pp., 1983.

## FUN RUN

RUNNERS: Enter the FUN RUN (unofficial activity during the AGU Spring Meeting)

WHERE: Fort McHenry

WHEN: 6:30 PM, Wednesday, June 1

DETAILS: Check the information board located on the meeting level, Baltimore, Convention Center. Organizers: Stephen R. McNutt and Michael Konig

## NASA Budget in Congress

The House of Representatives has authorized \$161.7 million more than President Ronald Reagan proposed for the fiscal 1984 National Aeronautics and Space Administration (NASA) budget. The House NASA authorization bill (H.R. 2065) passed by voice vote on April 26. Five days earlier, the Senate Commerce, Science, and Technology Committee marked up S. 1096, the Senate's NASA authorization bill, and recommended \$171.6 million more than the Reagan proposal. The Senate is expected to vote on the bill in mid May, after which time a conference committee will iron out the differences between the House and Senate versions.

President Reagan requested a total NASA budget of \$7.1065 billion: \$3.7085 billion for research and development, \$150.5 million for construction of facilities, and \$1.2475 billion for research and program management (*Eos*, February 15, 1983, p. 65).

The House authorized a total of \$7.2882 billion, which includes \$5.8886 billion for research and development, \$137.1 million for

construction at facilities, and \$1.2425 billion for research and program management.

The Senate committee recommended a total budget of \$7.2781 billion: \$5.8885 billion for research and development, \$142.1 million for construction at facilities, and \$1.2475 billion for research and program management.

In the five R&D categories (see table), the largest recommended increases over the president's proposal were in technology utilization (150%) and space science and applications (approximately 8%).

Within space science and applications, the House authorized \$52 million more for physics and astronomy programs, with \$45 million of that increase targeted for the space telescope. In addition, all of the House's \$15 million increase for research and analysis. The Senate committee recommended increases to physics and astronomy programs of \$50 million for the space telescope, \$5 million for research and analysis. The committee recommended cancelling \$16 million proposed by President Reagan for the solar optical telescope.—BTR

Status of NASA FY 1984 Research and Development Budget, in Millions of Dollars

Activity	Reagan Proposal	House Bill*	Senate Committee Markup 4/21†
Space transportation systems	3498.0	3571.8	3558.0
Capability development	1927.4	2001.2	2022.4
Operations	1570.6	1570.6	1585.6
Space science and applications	1068.0	1152.0	1154.0
Physics and astronomy	514.6	566.6	568.6
Planetary exploration	205.4	220.4	215.4
Life sciences	50.0	59.0	59.0
Space Applications	289.0	306.0	321.0
Technology utilization	4.0	10.0	10.0
Aeronautics and space technology	458.3	454.0	466.3
Aeronautics	300.3	311.8	328.3
Space Technology	138.0	143.0	138.0
Tracking and data acquisition	700.2	700.2	700.2
Total research and development	5708.5	5888.6	5888.5

\*The House of Representatives passed the NASA Authorization Bill, H.R. 2065, by voice on April 26.

†These figures are the results of the budget markup of the Senate version of the NASA Authorization Bill, S. 1096, by the Senate Committee on Commerce, Science, and Technology on April 21. The bill is expected to be voted on by the entire Senate by mid May.

\*Includes solid earth observations, environmental observations, materials processing in space, communications, and information systems.



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 Appointee would teach at both undergraduate and graduate levels and should be able to teach several of Petrology, Mineralogy, Geochemistry, Field Geology, Physical Geology, Ph.D. required. In addition to teaching, research and service are required of faculty members at this university.  
 Applicants should submit a current curriculum vitae with names and addresses of three people who have agreed to provide references. Applications should be completed by July 30, 1983; however, late applications may be accepted until successful candidate is appointed.  
 Send applications to Dr. Lewis H. Cohen, Department of Earth Sciences, University of California, Riverside, California 92521.  
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**Bureau of Mineral Resources, Australia/Marine Geophysicist.** The Australian Bureau of Mineral Resources, Geology and Geophysics (BMGR) is charged with developing an integrated, comprehensive scientific understanding of the geology of the Australian continent and offshore areas as a basis for mineral exploration.  
 The Division of Marine Geosciences and Petroleum Geology undertakes a wide range of regional offshore geological and geophysical investigations and is responsible for the analysis and integration of geoscientific data collected by private petroleum exploration companies offshore.  
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**Postdoctoral Research Associate in Plasma Theory.** The Department of Physics, University of Denver invites applications for a research position in space plasma theory group.  
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**Research Associate/Petrology-Petrology.** To join a research effort aimed at understanding the condensation history of the solar system by mineral, chemical, and isotopic studies of primitive meteorites in primitive meteorites. Applicant need not have previous experience with meteorites but should have a superb petrographer, skilled in the use of the SEM and electron probe. Successful candidate will be dedicated, productive, an effective communicator both orally and in writing, and will have Ph.D. in hand. Vacancy expected in late summer or early autumn 1983.  
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 Department of Geology  
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 Athens, GA 30602.  
 Deadline for receipt of applications is June 20, 1983. Should sufficient candidates not be found, another search may be opened.  
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**Research Associate Position.** The Department of Earth and Planetary Sciences is seeking an individual with a Ph.D. in geophysics to lead a group effort in network seismology and earthquake hazards estimation.  
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**Position in Physics Department.** Research position in the area of space and basic plasma physics with emphasis on numerical simulation is available at the University of Texas, Austin.  
 This emerging space physics group will have a strong interaction with the fusion physics group of the Institute for Fusion Studies at the University of Texas at Austin. The position is available starting October 1983 but earlier appointment is possible. Salary commensurate with qualifications.  
 Send curriculum vitae, list of publications and the names of three referees to: Professor V.L. Patel, Department of Physics, University of Denver, Denver, CO 80202.

**Research Positions for Mathematical Physicists.** Applications are invited for several research positions at the Center for Studies of Nonlinear Dynamics, La Jolla Institute, beginning summer 1983. Current research involves work on nonlinear wave-wave interactions, acoustic, optical, and radio wave propagation in random media, and fluctuation phenomena in the study of hydrodynamic and geophysical systems. Physicists and applied mathematicians who are interested in working on problems of the above type should send resumes and arrange for three letters of recommendation to be sent to Dr. Stanley Hame, Director, CSND, La Jolla Institute, 8850 Villa La Jolla Drive, Suite 2150, La Jolla, California 92037.  
 La Jolla Institute is an equal opportunity/affirmative action employer.

**Research Scientist(s) in Space Physics.** The Laboratory for Atmospheric and Space Physics at the University of Colorado announces openings for one or more research scientists.  
 The successful candidate(s) will join our experimental research programs in solar terrestrial physics and planetary atmospheres. LASP has ongoing sounding rocket and satellite programs dedicated to the development of state-of-the-art instruments for space research.  
 An advanced degree is required; a background in solar, planetary or atmospheric sciences is desirable. Experience in sounding rocket or satellite research will be considered. Salary commensurate with experience.  
 Applications, including a current professional resume and the names of three references should be sent by June 10, 1983, to:  
 Dr. Charles A. Barth, Director  
 Laboratory for Atmospheric and Space Physics  
 Campus Box 392  
 University of Colorado  
 Boulder, CO 80509

**THE UNIVERSITY OF COLORADO IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.**

**Geophysical Oceanography.** The Department of Oceanography of Texas A&M University has an opening for a tenure track assistant professor in physical oceanography to be filled by September 1983.  
 Preference will be given to candidates with strong theoretical background in geophysical fluid dynamics.  
 The successful applicant will be expected to teach undergraduate and graduate courses and to conduct a vigorous research program in his or her specialty. A Ph.D. is required for this position and one year's experience in a postdoctoral position is desired. Salary is negotiable depending upon experience and qualifications.  
 Applicant should submit a vita along with a letter describing his/her research and teaching goals and names of five persons for reference to Professor R.O. Reid, Head, Department of Oceanography, Texas A&M University, College Station, TX 77843.  
 The closing date for applications is May 31, 1983. Texas A&M University is an affirmative action/equal opportunity employer.

**Postdoctoral Position in Physical Oceanography.** A postdoctoral appointment in physical oceanography will be available beginning September, 1983 in the College of Marine Studies, University of Delaware, Newark, DE. The initial appointment will be for one year with possible extension for a second year. The salary will be \$20,000—\$24,000 per year, depending on experience. Funds for the position will be available largely from a grant by NSF for conduct and analysis of a field observational study of the shelfbreak front in the Middle Atlantic Bight.  
 The person obtaining the appointment would be responsible for a portion of the planning and execution of the field study, much of the subsequent data analysis and interpretation, and teaching of one graduate level course in physical oceanography each year. The successful applicant must have received the Ph.D. in physical oceanography or a closely related field by the starting date of his appointment. Preference will be given to applicants with direct experience in field observations.  
 To apply send a complete resume and the names of three references to Professor R.W. Garvine, College of Marine Studies, University of Delaware, Newark, DE 19711. Telephone: 302-738-2100.  
 The University of Delaware is an equal opportunity/affirmative action employer.

**Chairman—Department of Geological Sciences, Wright State University.** The Department of Geological Sciences, Wright State University, is seeking an individual to be appointed September 1984. The successful candidate will be a dynamic individual with administrative talent and an appreciation for research and practice-related educational activities. Rank is at full professor level and no restrictions have been placed on the type of specialization. The department is active with yet maintaining a firm commitment to basic research.  
 Send a letter of application, curriculum vitae and names of three references to:  
 Chairman, Search Committee  
 Department of Geological Sciences  
 Wright State University  
 Dayton, OH 45435.  
 Wright State University is an affirmative action/equal opportunity employer. Closing date for position is October 31, 1983.

**University of Colorado, Boulder, Geochronologist Position.** Geochronologist with active research program in stable isotopes, radiometric isotopes, and/or trace element analysis is being sought for a joint appointment in the Department of Geological Sciences and the Cooperative Institute for Research in Environmental Sciences (CIRES) of the University of Colorado. The one-half time position within the Department of Geological Sciences is tenure track at the assistant or associate professor level with a starting salary of \$12,000—\$15,000 for the academic year.  
 Teaching load will be half that of full-time faculty with appropriate office and laboratory space. One-half academic year salary will be guaranteed. CIRES for two years at the departmental rate. After two years incumbent must generate his/her CIRES salary further by generating three months of summer salary from contracts and grants, and consulting.  
 Applicants with experience, publications, and/or preferred starting date would be preferred.  
 Closing date for applications is October 1, 1983. Applications should include statement of research goals and teaching interests, a full vitae, and four letters of reference.  
 Apply to: Professor Charles Stern, Chairman, Geological Sciences Search Committee, Department of Geological Sciences, Campus Box 250, University of Colorado, Boulder, CO 80509.  
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**Geology (with emphasis on petrology)/University of California, Riverside.** Visiting Lecturer opening beginning 1 September 1983. Although the initial appointment will be as a lecturer, and is annual, the appointment could lead to a full-time position next year.  
 Appointee would teach at both undergraduate and graduate levels and should be able to teach several of Petrology, Mineralogy, Geochemistry, Field Geology, Physical Geology, Ph.D. required. In addition to teaching, research and service are required of faculty members at this university.  
 Applicants should submit a current curriculum vitae with names and addresses of three people who have agreed to provide references. Applications should be completed by July 30, 1983; however, late applications may be accepted until successful candidate is appointed.  
 Send applications to Dr. Lewis H. Cohen, Department of Earth Sciences, University of California, Riverside, California 92521.  
 The University of California is an Equal Opportunity/Affirmative Action Employer.

**Bureau of Mineral Resources, Australia/Marine Geophysicist.** The Australian Bureau of Mineral Resources, Geology and Geophysics (BMGR) is charged with developing an integrated, comprehensive scientific understanding of the geology of the Australian continent and offshore areas as a basis for mineral exploration.  
 The Division of Marine Geosciences and Petroleum Geology undertakes a wide range of regional offshore geological and geophysical investigations and is responsible for the analysis and integration of geoscientific data collected by private petroleum exploration companies offshore.  
 The Division is seeking a Marine Geophysicist to analyze relevant data on the stratigraphy, structure and evolution of Australian continental margins. Research experience in seismic stratigraphy is highly desirable. Experience in structural and thermal geoscientific analysis would be of value.  
 Classification will be at Principal Research Scientist or Senior Principal Research Scientist level depending on the successful candidate's qualifications and experience.  
**QUALIFICATIONS:** A Ph.D. (or equivalent) together with demonstrated research ability.  
**SALARY:** Principal Research Scientist (PRS)—\$43,580-\$44,670, Senior Principal Research Scientist (SPRS)—\$44,260-\$45,460.  
**CONDITIONS:** Conditions of service include accommodation, long service leave, four weeks annual leave and removal expenses to Canberra. Permanent appointment is available to persons who are British subjects eligible for permanent residence in Australia. A term engagement would be considered for persons not meeting this criterion.  
 Applications together with full personal and professional details and the names of at least three referees should be sent to:

The Director  
 Bureau of Mineral Resources  
 P.O. Box 378  
 CANBERRA CITY ACT 2601  
 AUSTRALIA  
 Applications close 5 June 1983.

**Postdoctoral Research Associate in Plasma Theory.** The Department of Physics, University of Denver invites applications for a research position in space plasma theory group.  
 Candidate should hold Ph.D. in plasma theory with strong background in quasilinear and nonlinear methods of plasma instabilities, including numerical methods and computer simulation techniques.  
 The position is suitable for a recent Ph.D. recipient. Candidates with one or two years of post Ph.D. experience with successful publication record will also be considered. The research program in space plasma theory includes wave mechanisms, ion beam instabilities and parametric instabilities. The project requires limited amount of processing of space plasma data for theoretical support. Experience in plasma physics is desirable but not essential, familiarity with CRAY-1 computer is useful.  
 The position is available starting October 1983 but earlier appointment is possible. Salary commensurate with qualifications.  
 Send curriculum vitae, list of publications and the names of three referees to: Professor V.L. Patel, Department of Physics, University of Denver, Denver, CO 80202.

**Research Associate.** The Stanford University School of Earth Sciences and the Center for Materials Research seeks research-oriented scientist for an initial three-year appointment to start approximately October 1983 whose responsibilities will include:  
 (1) Supervision and maintenance of a new XRF-XRD facility.  
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 (3) interaction with our microprobe technician in optimizing software for geological applications.  
 Duties will include training faculty and student users of the XRF, XRD, and ESCA, but not service work. Experience in operation of XRF, XRD, and/or electron microprobe required; we will train on the ESCA. A good working knowledge of DEC Series 11 computers (11/02, 11/23, 11/34) operating under the RSX-11M monitor and of FORTRAN level programming is essential. Although we envision that the duties associated with this new equipment will constitute a full-time job for a year or two, we prefer Ph.D. level applicants who desire eventually to develop their own research program in conjunction with Stanford geology faculty.  
 Send C.V. to Gail Mahood, Department of Geology, Stanford University, Stanford, CA 94305.  
 Stanford University is an equal opportunity/affirmative action employer.

**Research Associate.** The Earth Resources Laboratory of the Department of Earth and Planetary Sciences is seeking a research staff member for digital full waveform acoustic log data analysis.  
 The applicant should have a Ph.D. in geophysics or electrical engineering/computer science with at least three years industrial experience with well log analysis.  
 Duties will include the development of data analysis packages for full waveform acoustic log, initiating new data analysis techniques and directing the handling of digital data at the Earth Resources Laboratory. Individual will also be expected to supervise the program and data transfer between ERL and members of the full waveform acoustic logging consortium.  
 Please state minimum salary requirements.  
 Professor M.N. Toksoz  
 c/o Vera Ballard  
 E19-238  
 M.I.T.  
 Cambridge, MA 02139  
 MIT is an equal opportunity/affirmative action employer.

**Research Associate/Petrology-Petrology.** To join a research effort aimed at understanding the condensation history of the solar system by mineral, chemical, and isotopic studies of primitive meteorites in primitive meteorites. Applicant need not have previous experience with meteorites but should have a superb petrographer, skilled in the use of the SEM and electron probe. Successful candidate will be dedicated, productive, an effective communicator both orally and in writing, and will have Ph.D. in hand. Vacancy expected in late summer or early autumn 1983.  
 Send resume and names of three references to: L. Grossman, Department of the Geological Sciences, University of Chicago, 5734 S. Ellis Avenue, Chicago, IL 60637.  
 The University of Chicago is an equal opportunity/affirmative action employer.

**University of Georgia/Faculty Positions.** The Department of Geology anticipates hiring as many as five people at the rank of Assistant Professor, Professor, or either a permanent (tenure track) or temporary basis.  
 Duties include teaching undergraduate and graduate courses and conducting research.  
 Teaching/research specializations to be considered include: economic geology, geochemistry, mineralogy, paleontology, sedimentation, structural geology, geophysics, and marine geology.  
 Letter of application—including a statement of specific teaching and research interests, curriculum vitae, and names and addresses of three references—should be sent to: Head  
 Department of Geology  
 University of Georgia  
 Athens, GA 30602.  
 Deadline for receipt of applications is June 20, 1983. Should sufficient candidates not be found, another search may be opened.  
 The University of Georgia is an equal opportunity/affirmative action employer.

**Structural Geology/Petrology.** Lafayette College seeks a person to teach undergraduate physical and structural geology, igneous and metamorphic petrology, and additional courses, dependent on applicant's interests. Ability to teach introductory geophysics is desirable but not mandatory. Teaching load averages ten to twelve contact hours and two or three (Ph.D.) completed or instructor (Ph.D. pending). Send application and resume, and arrange for three reference letters to Dr. Richard W. Park, Department of Geology, Lafayette College, Easton, PA 18042.  
 Lafayette College is an equal opportunity employer. M/F. Women and minorities are encouraged to apply.

**Research Associate Position.** The Department of Earth and Planetary Sciences is seeking an individual with a Ph.D. in geophysics to lead a group effort in network seismology and earthquake hazards estimation.  
 The successful candidate should have a solid background in both theoretical and observational seismology, as well as a minimum of three years working knowledge of field seismic network operation. A working knowledge of field seismicological techniques, probabilistic hazard estimation, and strong motivation seismology is also desirable. Applicant must have proven ability to lead a group research effort.  
 Submit resumes to:  
 M.N. Toksoz  
 c/o Vera Ballard  
 Personnel Office, E19-238  
 MIT  
 Cambridge, MA 02139  
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**Position in Physics Department.** Research position in the area of space and basic plasma physics with emphasis on numerical simulation is available at the University of Texas, Austin.  
 This emerging space physics group will have a strong interaction with the fusion physics group of the Institute for Fusion Studies at the University of Texas at Austin. The position is available starting October 1983 but earlier appointment is possible. Salary commensurate with qualifications.  
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 Bureau of Mineral Resources  
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 (2) Supervision of a new ESCA spectrometer, and  
 (3) interaction with our microprobe technician in optimizing software for geological applications.  
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